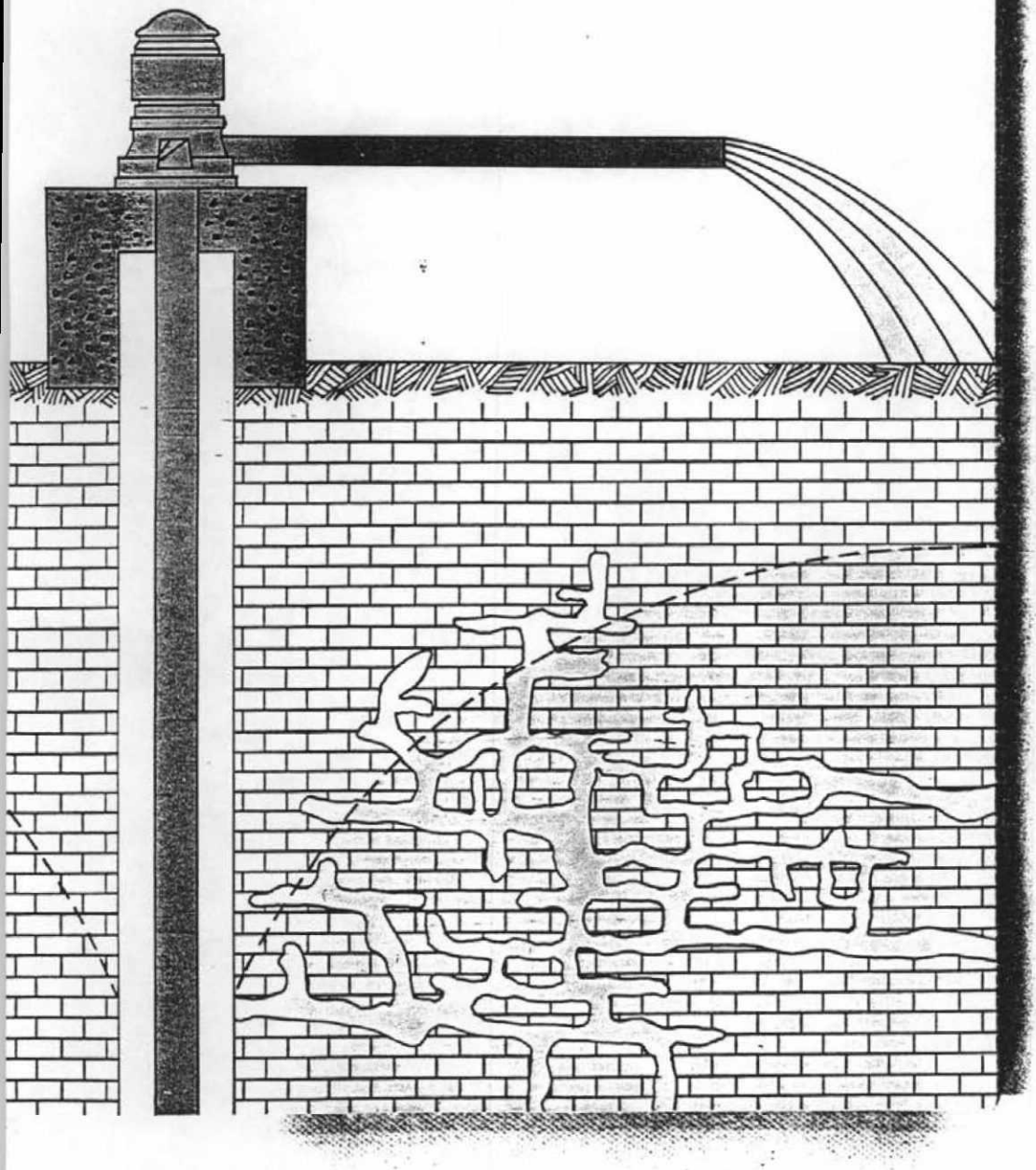
GROUND-WATER RESOURCES OF THE BIRMINGHAM AND CAHABA VALLEYS, JEFFERSON COUNTY, ALABAMA

GEOLOGICAL SURVEY OF ALABAMA *CIRCULAR 103*



GEOLOGICAL SURVEY OF ALABAMA

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CIRCULAR 103

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by

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Prepared in cooperation with the City of Birmingham and Jefferson County

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ILLUSTRATIONS

(Plate in pocket)

FIGURES

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(Tables 1 and 2 in Basic Data Section)

STRUCTURE

The structural geology of the areas of investigation is complex and distinctly affects the occurrence of ground water in some areas. The study areas contain a series of anticlines and synclines that have parallel thrust faults and high-angle cross faults (fig. 1). The Birmingham-Big Canoe Valley is developed upon a faulted asymmetrical anticlinorium that exposes limestones, dolomites, shales, sandstones, and cherts (Johnston, 1933). Many of the geologic formations dip steeply into the subsurface as a result of the intense folding. A large amount of faulting and jointing associated with the folding of the rocks has displaced and broken the rocks in many areas. This has resulted in increased solution and porosity of the rocks. The faults can adversely affect water-well development because the broken zones in and near the faults may produce large amounts of sediment. Careful selection of test drilling sites near fault zones is warranted.

HYDROLOGY

HYDROLOGIC CYCLE

Precipitation, surface runoff, evapotranspiration, and ground-water recharge and discharge are major components of the hydrologic cycle (fig. 2). Through this cycle, and as a result of natural processes, water can be continuously purified and used by plants and animals without depleting the supply. The oceans are the primary reservoir that supplies and receives the enormous quantities of water involved in the hydrologic cycle. The recycling of this water to and from the ocean results from forces exerted predominantly by the sun's energy and the earth's gravity. In general, the sun supplies energy to evaporate water from the ocean. This water rises as a vapor into the atmosphere where it forms clouds. Eventually, this moisture moves over the land, condenses, and falls back to the earth in some form of precipitation. Responding to gravity, this precipitation then begins a slow but constant movement through the surface- and ground-water systems back toward the ocean.

In Jefferson County, an average of 53 inches of precipitation, usually rain, falls on the land surface each year. This 53 inches of rain falling upon the 1,120 square miles in Jefferson County is equal to about 138 billion cubic feet or slightly more than 1 trillion gallons of water each year. Not all of this water is available for man's use because of the requirements of the other components of the hydrologic cycle. A